

Declaration shows that the known compounds are ordinary hydrotalcites having a X-ray diffraction image exhibiting a plurality of peaks in a region of  $2\theta = 33$  to  $50^\circ$  while the presently claimed composite metal polybasic salt has a single peak in this region, which unexpectedly results in an excellent additive for resins, heat insulators and anion exchangers.

Although the outstanding Office Action was made final, Applicants note that the anticipation rejections were not repeated and therefore presume that the anticipation rejections were withdrawn in view of the previous Response and that only the obviousness rejections remain.

Accordingly, Applicants respectfully request the Examiner to enter the amendment, reconsider the rejections in view of the remarks, claim amendment and submitted evidence and allow all claims pending in this application.

**1. Rejection of Claims 1, 11, 17, 24, 31-33, 38, 40-41 and 43  
under 35 U.S.C. § 103(a)**

The Office Action rejects claims 1, 11, 17, 24, 31-33, 38, 40-41 and 43 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 4,454,244 ("Woltermann"). The Office Action states:

Woltermann is relied upon as discussed in the last Office Action. It would be prima facie obvious to employ sulfate as the anion in the

composition of Woltermann. Applicant's argument, that Woltermann does not provide any suggestions or motivation to combine zinc and magnesium and further fails to teach that an anion A is sulfuric acid, is not convincing, since applicant's claims do not require the presence of magnesium. In any event, Woltermann discloses in the sentence bridging columns 1 and 2 that the composition may contain magnesium as a divalent metal, and discloses at column 2, lines 6-11 that the anion in the composition may be sulfate. Applicant's argument, that even assuming arguendo that a prima facie case has been established, applicant rebuts the presumption with evidence of unexpected results in that the claimed composition unexpectedly provides a completely new crystalline structure exhibiting single X-ray diffraction peaks in a region where  $2\theta$  is 60 to 64°, is not convincing, since applicant has not provided evidence showing that such X-ray diffraction peaks would be "unexpected". There is no evidence on record showing that the process disclosed by Woltermann would not also provide a composition having the crystalline structure as recited in applicant's claims. Obviousness would not require predictability as to the type of crystalline structure which would be exhibited by the compositions produced according to the process of Woltermann. It is only necessary that Woltermann fairly suggests doing what applicant has done, and Woltermann clearly suggests substituting a sulfate ion for the nitrate ions exemplified in Examples 1-4, since Woltermann establishes the equivalence between nitrate and sulfate ions at column 2, line 7.

Applicants respectfully traverse this rejection because independent claim 1 has been amended to contain the presence of magnesium. Therefore, as argued previously, the outstanding Final

Office Action fails to establish all three prongs necessary for a *prima facie* case of obviousness. Specifically, the prior art does not provide any suggestion or motivation to combine Zn and Mg and further fails to teach that an anion A is sulfuric acid. Even assuming *arguendo* that a *prima facie* has been established, Applicants rebut the presumption with evidence of unexpected results as entered into the record by the Minagawa Declaration. The Minagawa Declaration shows that the presently claimed invention has a completely new crystalline structure exhibiting a single X-ray diffraction peak in a region where  $2\theta$  is 33 to  $50^\circ$  and in a region where  $2\theta$  is 60 to  $64^\circ$ , which unexpectedly results in an excellent additive for resins, heat insulators and anion exchangers.

Turning to the rule, the Federal Circuit held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970). However, if a *prima facie* case of obviousness has been established, secondary considerations such as commercial success, long felt but unsolved need, failure of others, and unexpected results may

nevertheless give rise to a patentable invention. Graham v. John Deere Co., 148 U.S.P.Q. 459 (1966). Where the claimed and prior art products are substantially similar, a *prima facie* case of obviousness can also be rebutted by demonstrating that the prior art products do not possess the characteristics of the claimed invention. In re Best, 196 U.S.P.Q. 430, 433 (C.C.P.A. 1977).

In the present application, independent claim 1 has been amended to recite a composite metal polybasic salt having a chemical composition represented by the following general formula (1),



wherein  $\text{M}^3$  is a trivalent metal, A is a sulfuric acid ion, and a, b, x, y and z are numbers satisfying the following formulas,

- i)  $0 \leq a, 0 < b$
- ii)  $3x + 2(a + b) - y - mz = 0$  (wherein m is a valency of anion A),
- iii)  $0.3 \leq (a + b)/x \leq 2.5$ ,
- iv)  $1.5 \leq y/(x + a + b) \leq 3.0$ , and
- v)  $4.0 \leq (x + a + b)/z \leq 20.0$ , and

n is a number of not larger than 7, exhibiting diffraction peaks at  $2\theta = 2$  to  $15^\circ$ ,  $2\theta = 19.5$  to  $24^\circ$ , a single peak at  $2\theta = 33$  to  $50^\circ$ , and a single peak at  $2\theta = 60$  to  $64^\circ$  in

the X-ray diffraction (Cu- $\alpha$ ).

Woltermann, on the other hand, fails to satisfy the first and second prongs of the *prima facie* case because Woltermann merely discloses a very general teaching of composite polybasic salts that does not disclose the novel crystalline structure of the presently pending claims or provide any suggestion to modify the components for any specific purpose. Woltermann simply fails to provide any teaching regarding the specific combination of Zn and Mg in the general formula (1)  $\text{MgZn}_b\text{M}^3_x(\text{OH})_y(\text{A})_z \cdot n\text{H}_2\text{O}$  other than by exemplifying Zn and Mg as possible divalent metals. Nothing in Woltermann discloses the desirability of pairing Zn and Mg with each other as is presently claimed in the general formula (1) of pending claim 1.

Woltermann also fails to teach that an anion A of a polybasic salt of the general formula (1) is sulfuric acid salt or that the sulfuric acid salt anion can undergo ion-exchange to produce carbonic, silicic, organocarboxylic or phosphoric acid ion. None of the Examples of Woltermann specifically teach that the anion is a sulfuric acid ion or the exchange of ions with other anions.

Accordingly, a *prima facie* case of obviousness has not been established. Woltermann cannot be applied against the presently claimed invention and there simply is no suggestion in the prior art at the time the invention was made that the claimed limitations result in a novel crystalline structure. However, even assuming

that a *prima facie* case has been established, the presently claimed invention achieves unexpected results over Woltermann insofar as the presently claimed polybasic metal salt exhibits a single peak in a region where  $2\theta$  is 33 to  $50^\circ$  and in a region where  $2\theta$  is 60 to  $64^\circ$ , which unexpectedly results in an excellent additive for resins, heat insulators and anion exchangers.

In support thereof, Fig. A of the Minagawa Declaration shows an X-ray diffraction image of a hydrotalcite compound prepared according to Example 1 of Woltermann as well as that of the presently claimed polybasic metal salt. As can clearly be seen, the hydrotalcite compound of Woltermann exhibits a plurality of peaks in a region where  $2\theta$  is 33 to  $50^\circ$  and no peak in a region where  $2\theta$  is 60 to  $64^\circ$ . In contrast, the presently claimed invention does not contain a plurality of peaks where  $2\theta$  is 33 to  $50^\circ$  and a single peak in a region where  $2\theta$  is 60 to  $64^\circ$ .

Although Woltermann discloses in the sentence bridging columns 1 and 2 that a composition may contain magnesium as a divalent metal, Applicants note that it is completely unexpected that making each and every one of the presently claimed limitations of using magnesium and an anion A of a polybasic salt of the general formula (1) wherein the sulfuric acid salt anion undergoes ion-exchange to produce carbonic, silicic, organocarboxylic or phosphoric acid ion result in an excellent additive for resins, heat insulators and

anion exchangers. It is noted that Applicants are not arguing the unexpectedness of different X-ray diffraction images for what are different compounds but rather that the claimed limitations unexpectedly result in an excellent additive for resins, heat insulators and anion exchangers.

Turning to the assertion that Woltermann suggests substituting a sulfate ion for the nitrate ions, Applicants note that Fig. B of the Minagawa Declaration while relating to the Bhattacharyya reference as discussed infra nevertheless demonstrates that even where the nitric acid radicals are ion-exchanged with sulfuric acids, the ion-exchanged hydrotalcite compounds of the known references still show a plurality of peaks in the region of  $2\theta = 33$  to  $55^\circ$ . Therefore, the substituted sulfate ions are different from the presently claimed polybasic metal salt compounds similar to the nitric acid radical containing compounds of Woltermann.

Clearly, the polybasic salt is not obvious over the teachings of Woltermann. There is nothing in the cited reference that would have motivated one of ordinary skill in the art to make the specifically claimed novel crystalline structure from the laundry list of components provided in Woltermann.

Accordingly, Applicants respectfully submit that the presently claimed invention is unobvious over Woltermann and respectfully request the Examiner to reconsider and withdraw the § 103(a)

rejection.

**2. Rejection of Claims 1, 11, 17, 24, 31-33, 38, 40-41 and 43  
under 35 U.S.C. § 103(a)**

The Office Action rejects claims 1, 11, 17, 24, 31-33, 38, 40-41 and 43 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,071,433 ("Bhattacharyya"). The Office Action states:

It would be prima facie obvious to employ sulfate as the anion for the composition of Bhattacharyya. Applicant's argument, that nothing in Bhattacharyya teaches or suggests that zinc and magnesium are contained as divalent metals, is not convincing, since applicant's claims do not require that magnesium be present. In any event, Bhattacharyya teaches at column 4, lines 20 and 21 that magnesium may function to control the acidity or basicity of the catalyst, accordingly the resulting composition would contain magnesium. Bhattacharyya further discloses at column 4, lines 25-31 that the anion in the composition may be sulfate. Applicant's argument, that Bhattacharyya fails to teach that a polybasic salt undergoing claimed process conditions exhibit a single X-ray diffraction in the region where  $2\theta$  equals  $33^\circ$  to  $50^\circ$ , is not convincing, since obviousness would not require predictability as to the type of crystalline structure which would be exhibited by the compositions formed according to the process of Bhattacharyya. It is only necessary that Bhattacharyya fairly suggest doing what applicant has done, and Bhattacharyya suggests the process recited in applicant's claim 11 in Example 1 in conjunction with the disclosure at column 4, line 28 that the anion may be sulfate. There



is no evidence on record showing that the composition prepared according to the process of Bhattacharyya would not also exhibit the X-ray diffraction peaks as recited in applicant's claims. Applicant's argument, that Bhattacharyya fails to teach the exchange of ions with other anions is not convincing. Regarding claim 38, Bhattacharyya discloses at column 4, line 28 that the anion be carbonate.

No distinction is seen between the composition of Bhattacharyya when the anion is carbonate, and that recited in applicant's claim 38 when a sulfate ion has been exchanged with the carbonate ion. Regarding claim 43, one of ordinary skill in the art would expect that the compositions of Bhattacharyya would be capable of undergoing the conventional technique of ion exchange.

Applicants respectfully traverse this rejection because independent claim 1 has been amended to contain the presence of magnesium. Therefore, as argued previously, the outstanding Final Office Action fails to establish all three prongs necessary for a *prima facie* case of obviousness. Specifically, the prior art does not provide any suggestion or motivation to combine Zn and Mg and further fails to teach that an anion A is sulfuric acid. Even assuming *arguendo* that a *prima facie* has been established, Applicants rebut the presumption with evidence of unexpected results as entered into the record by the Minagawa Declaration. The Minagawa Declaration shows that the presently claimed invention has a completely new crystalline structure exhibiting a single X-ray diffraction peak in a region where  $2\theta$  is 33 to 50° and in a

region where  $2\theta$  is 60 to  $64^\circ$ , which unexpectedly results in an excellent additive for resins, heat insulators and anion exchangers.

Turning to the rule, the Federal Circuit held that a *prima facie* case of obviousness must establish: (1) some suggestion or motivation to modify the references; (2) a reasonable expectation of success; and (3) that the prior art references teach or suggest all claim limitations. Amgen, Inc. v. Chugai Pharm. Co., 18 USPQ2d 1016, 1023 (Fed. Cir. 1991); In re Fine, 5 USPQ2d 1596, 1598 (Fed. Cir. 1988); In re Wilson, 165 USPQ 494, 496 (C.C.P.A. 1970). However, if a *prima facie* case of obviousness has been established, secondary considerations such as commercial success, long felt but unsolved need, failure of others, and unexpected results may nevertheless give rise to a patentable invention. Graham v. John Deere Co., 148 U.S.P.Q. 459 (1966). Where the claimed and prior art products are substantially similar, a *prima facie* case of obviousness can also be rebutted by demonstrating that the prior art products do not possess the characteristics of the claimed invention. In re Best, 196 U.S.P.Q. 430, 433 (C.C.P.A. 1977).

In the present application, independent claim 1 has been amended to recite a composite metal polybasic salt having a chemical composition represented by the following general formula (1),



wherein  $\text{M}^3$  is a trivalent metal, A is a sulfuric acid ion, and a, b, x, y and z are numbers satisfying the following formulas,

- i)  $0 \leq a, 0 < b$
- ii)  $3x + 2(a + b) - y - mz = 0$  (wherein m is a valency of anion A),
- iii)  $0.3 \leq (a + b)/x \leq 2.5$ ,
- iv)  $1.5 \leq y/(x + a + b) \leq 3.0$ , and
- v)  $4.0 \leq (x + a + b)/z \leq 20.0$ , and

n is a number of not larger than 7, exhibiting diffraction peaks at  $2\theta = 2$  to  $15^\circ$ ,  $2\theta = 19.5$  to  $24^\circ$ , a single peak at  $2\theta = 33$  to  $50^\circ$ , and a single peak at  $2\theta = 60$  to  $64^\circ$  in the X-ray diffraction (Cu- $\alpha$ ).

Bhattacharyya, on the other hand, fails to satisfy the first and second prongs of the *prima facie* case because Bhattacharyya merely discloses a very general teaching of composite polybasic salts that does not disclose the novel crystalline structure of the presently pending claims or provide any suggestion to modify the components for any specific purpose. Bhattacharyya simply fails to provide any teaching regarding the specific combination of Zn and Mg in the general formula (1)  $\text{MgZn}_b\text{M}^3_x(\text{OH})_y(\text{A})_z \cdot n\text{H}_2\text{O}$ . Nothing in Bhattacharyya discloses the desirability of pairing Zn and Mg with

each other as is presently claimed in the general formula (1) of pending claim 1. 8

Bhattacharyya also fails to teach that an anion A of a polybasic salt of the general formula (1) is sulfuric acid salt or that the sulfuric acid salt anion can undergo ion-exchange to produce carbonic, silicic, organocarboxylic or phosphoric acid ion. None of the Examples of Bhattacharyya specifically teach that the anion is a sulfuric acid ion or the exchange of ions with other anions.

Any admonition that it would have been "obvious to try" to vary the components to arrive at a new crystalline structure is improper because in some cases, what would have been "obvious to try" would have been to vary all parameters or try each of numerous choices until one possibly arrived at a successful result. Since Bhattacharyya does not provide any indication that the claimed limitations result in a new crystalline structure or provide any guidance, it would not have been obvious to try to make the presently claimed invention incorporating the claimed limitations. See In re O'Farrell, 853 F.2d 894, 903, U.S.P.Q.2d 1673, 1681 (Fed. Cir. 1988).

Accordingly, a *prima facie* case of obviousness has not been established. Bhattacharyya cannot be applied against the presently claimed invention and there simply is no suggestion in the prior

art at the time the invention was made that the claimed limitations result in a novel crystalline structure. However, even assuming that a *prima facie* case has been established, the presently claimed invention achieves unexpected results over Bhattacharyya insofar as the presently claimed polybasic metal salt exhibits a single peak in a region where  $2\theta$  is 33 to  $50^\circ$  and in a region where  $2\theta$  is 60 to  $64^\circ$ , which unexpectedly result in an excellent additive for resins, heat insulators and anion exchangers.

In support thereof, Fig. B of the Minagawa Declaration shows X-ray diffraction images of a hydrotalcite compound prepared according to Example 1 of Bhattacharyya, a sulfate-ion substituted embodiment of Example 1 of Bhattacharyya and an image of the presently claimed polybasic metal salt. As can clearly be seen, the hydrotalcite and sulfate-ion substituted compounds of Bhattacharyya exhibit a plurality of peaks in a region where  $2\theta$  is 33 to  $50^\circ$  and no peak in a region where  $2\theta$  is 60 to  $64^\circ$ . In contrast, the presently claimed invention does not contain a plurality of peaks where  $2\theta$  is 33 to  $50^\circ$  and a single peak in a region where  $2\theta$  is 60 to  $64^\circ$ .

Applicants note that it is completely unexpected that making each and every one of the presently claimed limitations of using magnesium and an anion A of a polybasic salt of the general formula (1) wherein the sulfuric acid salt anion undergoes ion-exchange to

produce carbonic, silicic, organocarboxylic or phosphoric acid ion result in an excellent additive for resins, heat insulators and anion exchangers. It is further noted that Applicants are not arguing the unexpectedness of different X-ray diffraction images for what are different compounds but rather that the claimed limitations unexpectedly result in an excellent additive for resins, heat insulators and anion exchangers.

Turning to the Examiner's assertion that there is no distinction between which ions are substituted, Applicants note Fig. B, which clearly shows that where the nitric acid radicals are ion-exchanged with sulfuric acids, the ion-exchanged hydrotalcite compounds of the known reference still shows a plurality of peaks in the region of  $2\theta = 33$  to  $55^\circ$ . One of ordinary skill would therefore understand that substituting the anion with carbonate or sulfate does make a distinction as shown in different X-ray diffraction images. Only the specifically claimed limitation of a sulfate ion in combination with the other claimed limitations result in the presently claimed polybasic metal salt compounds.

Clearly, the presently claimed polybasic salt is not obvious over the teachings of Bhattacharyya. There is nothing in the cited reference that would have motivated one of ordinary skill in the art to make the specifically claimed novel crystalline structure from the laundry list of components provided in Bhattacharyya.

Accordingly, Applicants respectfully submit that the presently claimed invention is unobvious over Bhattacharyya and respectfully request the Examiner to reconsider and withdraw the § 103(a) rejection.

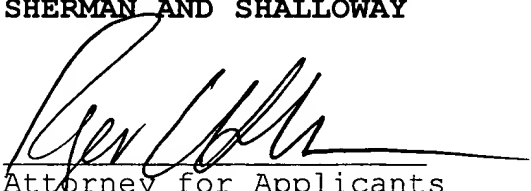
**CONCLUSION**

In light of the foregoing, Applicants submit that the application is now in condition for allowance. The Examiner is therefore respectfully requested to reconsider and withdraw the rejection of the pending claims and allow the pending claims. Favorable action with an early allowance of the claims pending is earnestly solicited.

Respectfully submitted,

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